UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER
IPPOLITO RAUSCH, NICOLE

ART UNIT	PAPER NUMBER
2881	

MAIL DATE	DELIVERY MODE
10/07/2011	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

PTOL-90A (Rev. 04/07)

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 September 2011*.

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

5)☒ Claim(s) *1-72* is/are pending in the application.

    5a) Of the above claim(s) *73-95* is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☐ Claim(s) _____ is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☒ The drawing(s) filed on *17 July 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

12)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☒ All   b)☐ Some *   c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)   4)☐ Interview Summary (PTO-413)
                                                            Paper No(s)/Mail Date. _____ .
2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)   5)☐ Notice of Informal Patent Application
3)☒ Information Disclosure Statement(s) (PTO/SB/08)
    Paper No(s)/Mail Date *See Continuation Sheet*.   6)☐ Other: _____ .

Continuation of Attachment(s) 3). Information Disclosure Statement(s) (PTO/SB/08), Paper No(s)/Mail Date :12/21/2007, 2/10/2010, 6/15/2010, 7/27/2010, 11/17/2010, 1/12/2011.

DETAILED ACTION

Election/Restrictions

1.   Claims 73-95 are withdrawn from further consideration pursuant to 37 CFR

1.142(b) as being drawn to a nonelected invention, there being no allowable generic or

linking claim. Election was made **without** traverse in the reply filed on 9/12/2011.

Specification

2.   The lengthy specification has not been checked to the extent necessary to

determine the presence of all possible minor errors. Applicant's cooperation is

requested in correcting any errors of which applicant may become aware in the

specification.

Claim Rejections - 35 USC § 101

3.   35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of
> matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the
> conditions and requirements of this title.

Claims 1-72 are rejected under 35 U.S.C. 101 because the claimed invention is directed

to non-statutory subject matter. Specifically, in this instance, these claims pertain to a

method that does not require a machine or transformation to be performed. If it could be

shown that "in a medical image data set" and "automatically" have some type of

meaning that would require the aide of a particular machine to perform the method

steps, then the 101 rejection could be removed. However, as the claims read now, no

machine is required, as the data set can well be a set of images already printed or

otherwise produced, and the term "automatically" does not necessarily require a

machine.

Claim Rejections - 35 USC § 102

4.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that

form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5.   Claims 1-5, 7-9, 11-14, 24-59 and 65-71 are rejected under 35 U.S.C. 102(e) as

being anticipated by Yoshida et al. (U.S. Patent Application Publication Number

20050152588, from hereinafter "Yoshida").

6.   In regards to claim 1, Yoshida teaches a method of centerline determination for a

tubular tissue in a medical image data set defined in a data space (paragraph 0109 and

the abstract, etc., teach the colon, which is tubular, paragraph 0109 likewise teaches

the data set), receiving at least one start point and one end point inside a tubular tissue

volume (paragraphs 0097, 0137, 0330, etc.), automatically determining a path between

said points that remain inside the volume (paragraphs 0097-0098, 0158, 0239, etc.),

automatically segmenting said tubular tissue using said path (paragraphs 0097-0098,

0155, 0239, 0288) and automatically determining a centerline for said tubular tissue for

segmentation (paragraphs 0097-0098, 0155, 0239, 0288) wherein said receiving, said

determining a path, said segmenting and said determining a centerline are all performed

on a same data space of said medical image data set (the specification gives no

indication that there is a data-space change).

7.   In regards to claim 2, Yoshida teaches that said tubular tissue comprises a body

lumen (see, i.e., paragraphs 0092, 0104, etc.).

8.   In regards to claims 3-4, Yoshida teaches that receiving comprises receiving at

most 2 points from a human user (paragraphs 0097, 0137, 0330, etc. teach a start and

end point-this is two points).

9.   In regards to claim 5, Yoshida teaches that automatically determining a path

comprises determining using targeted marching which uses a cost function

incorporating both path cost and estimated future cost (paragraph 0108, 0113, 0349-

0353, etc.).

10.   In regards to claim 7, Yoshida teaches that determining a path comprises

propagating a sub-path from one of said received points until it meets another of the

received points user (paragraphs 0097, 0137, 0330, etc. teach a start and end point-this

is two points, with the sub-path between them).

11.   In regards to claim 8, Yoshida teaches that propagating a sub-path comprises

selecting a point and selecting a neighbor of the selected point for further consideration

responsive to said cost function (paragraphs 0097, 0106, 0383, 0385, etc.).

12.   In regards to claim 9, Yoshida teaches that a path cost of a point is a function of

a local cost of a point and a path cost of at least one neighbor of the point (paragraphs

0097, 0106, 0383, 0385, etc.).

13.   In regards to claim 11, Yoshida teaches that a path cost is determined by

attempting to find at least an approximate solution to an equation including at least one

extreme-type function that returns an extreme value of its operands (paragraphs 0106-0107, 0148, 0239, etc., all teach finding the maxima, which is an extreme value).

14.   In regards to claim 12, Yoshida teaches that if a solution is not found, at least one of said extreme-type functions is replaced by a constant value (paragraphs 0242, 0279, etc.).

15.   In regards to claim 13, Yoshida teaches that said extreme-type function to replace is found by a min-max method (paragraphs 0106-0107, 0148, 0239, etc.).

16.   In regards to claim 14, Yoshida teaches that said equation includes an approximation of a gradient of the path cost (paragraphs 0135-0138, 0142, 0320-0340, etc.).

17.   In regards to claim 24, Yoshida teaches selecting a target to be used in an estimating of said future cost (paragraphs 0097, 0106, 0383, 0385, etc.).

18.   In regards to claim 25, Yoshida teaches that said estimating is an underestimating (paragraphs 0133, 0137, 0221, 0280, 0327, etc.).

19.   In regards to claim 26, Yoshida teaches that said estimating is based on an average cost per distance unit (paragraphs 0097, 0099, 0105-0107, 0135-0136, etc.).

20.   In regards to claim 27, Yoshida teaches that said estimating is based on an Euclidean distance to said target (paragraphs 0097, 0106, 0197, 0239, 0261, etc.).

21.   In regards to claim 28, Yoshida teaches that selecting a target comprises selecting from two or more possible targets (the entire document discusses multiple lesions, any of which could be the target).

22.   In regards to claim 29, Yoshida teaches that selecting a target comprises projecting two vectors mine for each of the two potential targets on a vector connecting a current point with a starting point of the current point and selecting a longer projection (paragraphs 0138-0139, 0170, 0338-0340, etc.).

23.   In regards to claim 30, Yoshida teaches that selecting a target comprises selecting one of said received points (the entire document discusses multiple lesions, any of which could be the target).

24.   In regards to claim 31, Yoshida teaches that automatically determining a path comprises fast marching (see, i.e., paragraphs 0108, 0350, etc.).

25.   In regards to claim 32, Yoshida teaches that automatically determining a path comprises determining using the A* path finding method (see, i.e., paragraphs 0108, 0350, etc.).

26.   In regards to claim 34, Yoshida teaches correcting said determined path (paragraphs 0295-0296, etc.).

27.   In regards to claim 35, Yoshida teaches that correcting said path comprising interconnecting path segments (paragraphs 0295-0296, etc.).

28.   In regards to claim 36, Yoshida teaches that segmenting uses a marching method of segmentation (paragraphs 0108, 0113, 0349-0353, etc.).

29.   In regards to claim 38, Yoshida teaches that said marching method assigns a value for each point in said tubular tissue (paragraphs 0108, 0113, 0349-0353, etc.).

30.   In regards to claim 39, Yoshida teaches that said marching method is a fast marching method (paragraphs 0108, 0113, 0349-0353, etc.).

31.   In regards to claim 40, Yoshida teaches that said segmenting comprises

generating a parameterization for points along said path (paragraphs 0164, 0200+).

32.   In regards to claim 41, Yoshida teaches propagating said parameterization

(paragraphs 0097, 0352, etc.).

33.   In regards to claim 42, Yoshida teaches that said propagated parameterization is

used to prevent leakage of said segmentation (paragraphs 0097, 0352, etc.).

34.   In regards to claim 43, Yoshida teaches that said parameterization is propagated

substantially parallel to said path (paragraphs 0097, 0352, etc.).

35.   In regards to claim 44, Yoshida teaches propagating said parameterization to

being substantially perpendicular to a path cost gradient associated with said

propagation (paragraphs 0097, 0351-354, etc.).

36.   In regards to claim 45, Yoshida teaches collecting propagation statistics for

different parameterization values (paragraphs 0097, 0351-354, etc.).

37.   In regards to claim 46, Yoshida teaches determining a direction of propagation

from a propagation parameterization value (paragraphs 0097, 0351-354, etc.).

38.   In regards to claim 47, Yoshida teaches controlling a direction of propagation

based on said parameterization (paragraphs 0097, 0351-354, etc.).

39.   In regards to claim 48, Yoshida teaches limiting propagation of at least one

parameterization value based on said statistics (paragraphs 0097, 0351-354, etc.).

40.   In regards to claim 49, Yoshida teaches that the limiting comprises limiting

propagation to be substantially locally uniform for nearby parameterizations (paragraphs

0097, 0351-354, etc.).

41.   In regards to claim 50, Yoshida teaches that said segmenting comprises partitioning said path into portions (paragraphs 0098, 0105-0107, 0130, 0155, 0212, 0239-0246, 0265-0266, 0278, etc.).

42.   In regards to claim 51, Yoshida teaches defining boundary planes between said portions (paragraphs 0098, 0105-0107, 0130, 0155, 0212, 0239-0246, 0265-0266, 0278, etc.).

43.   In regards to claim 52, Yoshida teaches that said portions overlap by a substantially small amount (paragraphs 0108, 0128, 0191, 0223, etc.).

44.   In regards to claim 53, Yoshida teaches that said portions are substantially straight lines (paragraphs 0108, 0128, 0191, 0223, etc.).

45.   In regards to claim 54, Yoshida teaches that said partitioning is used to reduce leakage of said segmentation (paragraphs 0108, 0128, 0191, 0223, etc.).

46.   In regards to claim 55, Yoshida teaches that said segmenting comprises propagating from said path (paragraphs 0097, 0351-354, etc.).

47.   In regards to claim 56, Yoshida teaches that said propagating is limited to be substantially perpendicular to said path (paragraphs 0097, 0351-354, etc.).

48.   In regards to claim 57, Yoshida teaches that said propagating is limited to be substantially locally uniform in a radial direction (paragraphs 0097, 0351-354, etc.).

49.   In regards to claims 58-59, Yoshida teaches that said local curvature is estimated by counting visited neighbors wherein said propagating depends on a local curvature (paragraphs 0097, 0351-354, etc.).

50.   In regards to claim 65, Yoshida teaches cleaning the segmentation (paragraphs 0108, 0128, 0191, 0223, etc.).

51.   In regards to claim 66, Yoshida teaches that determining a centerline comprises generating a distance map of said tubular tissue, of distances from an outer boundary of said tubular tissue inwards (paragraphs 0096-0097, 0105, 0116, 0178, etc.).

52.   In regards to claim 67, Yoshida teaches that generating a distance map comprises using morphological skeletonization of said segmentation (paragraphs 0096-0097, 0105, 0116, 0178, etc.).

53.   In regards to claim 68, Yoshida teaches that generating a distance map comprises using fast marching on said segmentation (paragraphs 0108, 0113, 0349-0354, etc.).

54.   In regards to claim 69, Yoshida teaches that determining a centerline comprises finding a path in said distance map (paragraphs 0096-0097, 0105, 0116, 0178, etc.).

55.   In regards to claim 70, Yoshida teaches that finding a path for said centerline comprises targeting marching from at least one end of said segmentation (paragraphs 0108, 0113, 0349-0354, etc.).

56.   In regards to claim 71, Yoshida teaches that said targeted marching for finding a path comprises taking a local curvature into account.

57.   In regards to claim 72, Yoshida teaches that said data set is 3 dimensional (see, i.e., paragraphs 0097, 0132, etc.).

Claim Rejections - 35 USC § 103

58.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set
> forth in section 102 of this title, if the differences between the subject matter sought to be patented and
> the prior art are such that the subject matter as a whole would have been obvious at the time the
> invention was made to a person having ordinary skill in the art to which said subject matter pertains.
> Patentability shall not be negatived by the manner in which the invention was made.

59.   This application currently names joint inventors. In considering patentability of

the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of

the various claims was commonly owned at the time any inventions covered therein

were made absent any evidence to the contrary. Applicant is advised of the obligation

under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was

not commonly owned at the time a later invention was made in order for the examiner to

consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g)

prior art under 35 U.S.C. 103(a).

60.   Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida

as applied to claim 5 above, and further in view of Krishnamoorthy et al. (U.S. Patent

Application Publication Number 20050110791, from hereinafter "Krishnamoorthy").

        In regards to claim 6, Yoshida fails to teach propagating a sub-path from each

of at least two of said received points until the sub-paths meet.

        Krishnamoorthy teaches propagating a sub-path from each of at least two of said

received points until the sub-paths meet (abstract, paragraphs 0079-0081, 0088 and

0098).

In view of the teaching of Krishnamoorthy it would have been obvious to one of ordinary skill in the art at the time the invention was made propagating a sub-path from each of at least two of said received points until the sub-paths meet. So doing gives an extra assurance of confidence that the propagation has been performed correctly, which in turn increases the accuracy of the calculation overall.

61.   Claim 33 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida as applied to claim 1 above, and further in view of Yim (U.S. Patent Application Publication Number 20030031351, from hereinafter "Yim").

In regards to claim 33, Yoshida fails to teach that automatically determining a path comprise determining using Dijkstra's minimal length path finding method.

Yim teaches that automatically determining a path comprise determining using Dijkstra's minimal length path finding method (paragraphs 0032, 0067, 0121, etc.).

In view of the teaching of Yim it would have been obvious to one of ordinary skill in the art at the time the invention was made that automatically determining a path comprise determining using Dijkstra's minimal length path finding method. This is a well-known model with a high reliability and efficiency, and as such, it would be obvious to utilize an existing model versus attempting to derive one unique to the instant application.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to NICOLE IPPOLITO-RAUSCH whose telephone number

is (571)270-7449. The examiner can normally be reached on Monday through

Thursday 6:30am-5:00pm.

  If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Robert Kim can be reached on (571)272-2293. The fax phone number for

the organization where this application or proceeding is assigned is 571-273-8300.

  Information regarding the status of an application may be obtained from the

Patent Application Information Retrieval (PAIR) system. Status information for

published applications may be obtained from either Private PAIR or Public PAIR.

Status information for unpublished applications is available through Private PAIR only.

For more information about the PAIR system, see http://pair-direct.uspto.gov. Should

you have questions on access to the Private PAIR system, contact the Electronic

Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a

USPTO Customer Service Representative or access to the automated information

system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/N. I./
Examiner, Art Unit 2881

/ROBERT KIM/

Supervisory Patent Examiner, Art Unit 2881